AGU FALL MEETING
San Francisco | 15–19 December 2014

H12A-03: Physical Processes Shaping Sahelian Heat Waves: Analysis Of Selected Case Studies

Monday, 15 December 2014
11:00 AM - 11:20 AM
Moscone West - 3018

In the Sahel, the temperature is extremely high in Spring, with typical monthly-mean values of daily minimum, maximum and mean temperature of respectively 30, 40 and 35°C (Guichard et al. J. Hydrology 2009). Therefore, heat waves occurring at this period of the year can have particularly severe repercussions. Furthermore, current climate projections suggest that their frequency and intensity may increase in the future. Numerous heat-wave studies have focused on the mid-latitudes, but almost none on the Sahel. However, the specificities of the Sahelian climate imply that the mechanisms at play in this semi-arid region differ from those previously identified in the mid-latitudes. The influence of the Saharan Heat low is strong in this region; the soil is mostly dry in Spring, and soil-moisture feedbacks identified in mid-latitude studies are therefore unlikely to operate during Sahelian heat waves at this time of year. The present study is carried out within the ACASIS ANR project, which focuses on these Sahelian events. Here, we make use of complementary datasets (SYNOP and soundings data, high-frequency weather and flux stations, satellite data, meteorological reanalyses), together with models, to explore the importance of physical processes during a few selected heat-wave cases chosen from 2006 to 2014. These events are first identified with commonly-used indexes and the associated large-scale circulations are documented. The time-sequences of the surface energy budget and boundary layer diurnal and nocturnal states are then presented, with estimations of non-negligible cloud and aerosol effects on surface radiative fluxes. Our results imply in particular a major importance of the monsoon flow during the night, which induces dramatic changes in the surface-atmosphere couplings, namely a sharp increase of the net longwave flux involving water vapour radiative properties, accompanied by a strong night-time warming. These processes are diversely captured by models and reanalyses.

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